Incorporating Malathion Actual Use Datasets in Endangered Species Exposure Assessments

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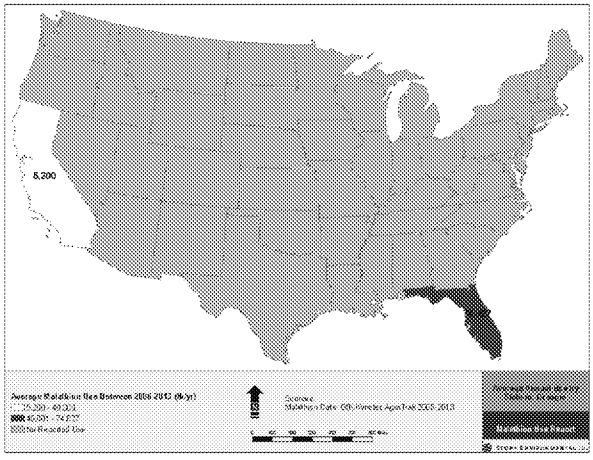
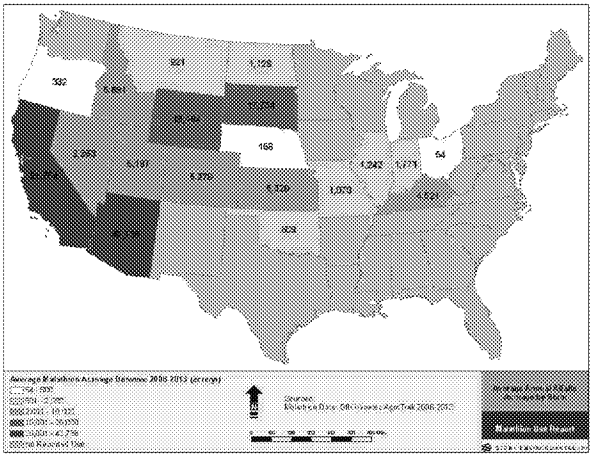
AgroTrak® Data for Malathion: Use by Crop/State

Total use and acres treated by year, crop, and state

Average Annual Use on Oranges (lbs)



Average Annual Alfalfa Treated (acres)

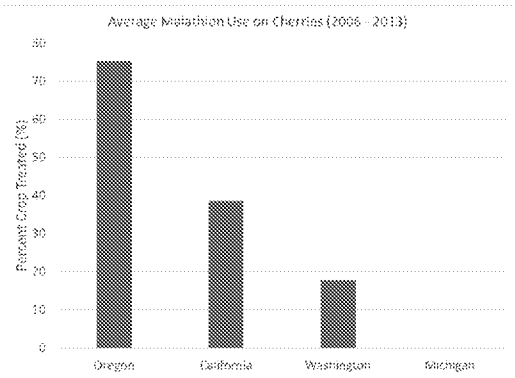


Example Oranges Use by Year Table

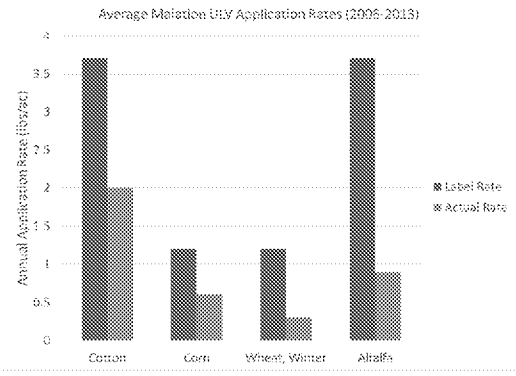
State	Annual Use (lb/year)								Average (lb/year)	% of total pounds
	2006	2007	2008	2009	2010	2011	2012	2013		
Florida	12,871	0	2,351	15,165	75,664	68,265	158,129	266,167	74,827	93.50%
California	2,604	9,534	1,391	20,838	517	3,070	2,053	1,592	5,200	6.50%

AgroTrak® Data for Malathion: Percent Crop Treated and Actual Rates

Percent Crop Treated (PCT) can be calculated from acres treated (base acres) and total acres grown.

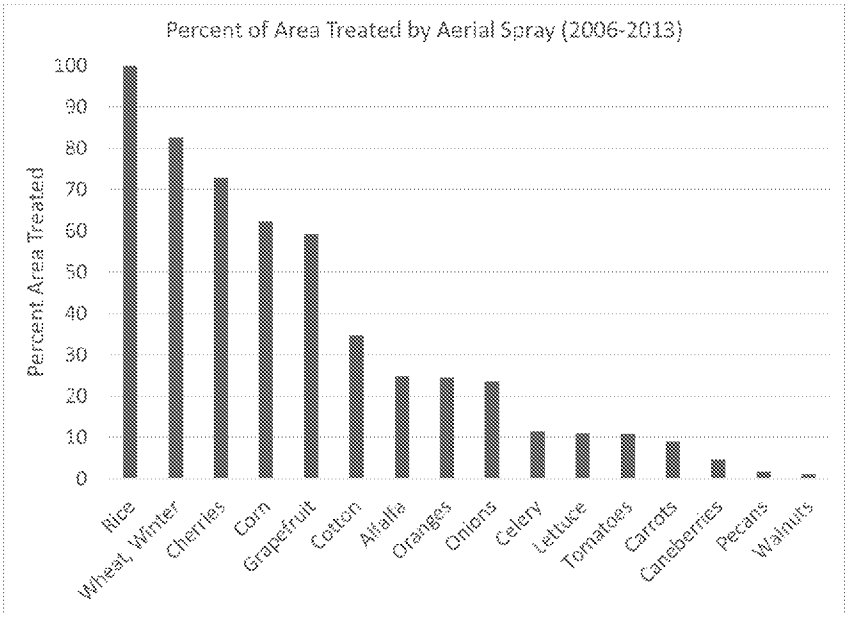


Actual application rates can be compared with maximum label rates at state and crop level.



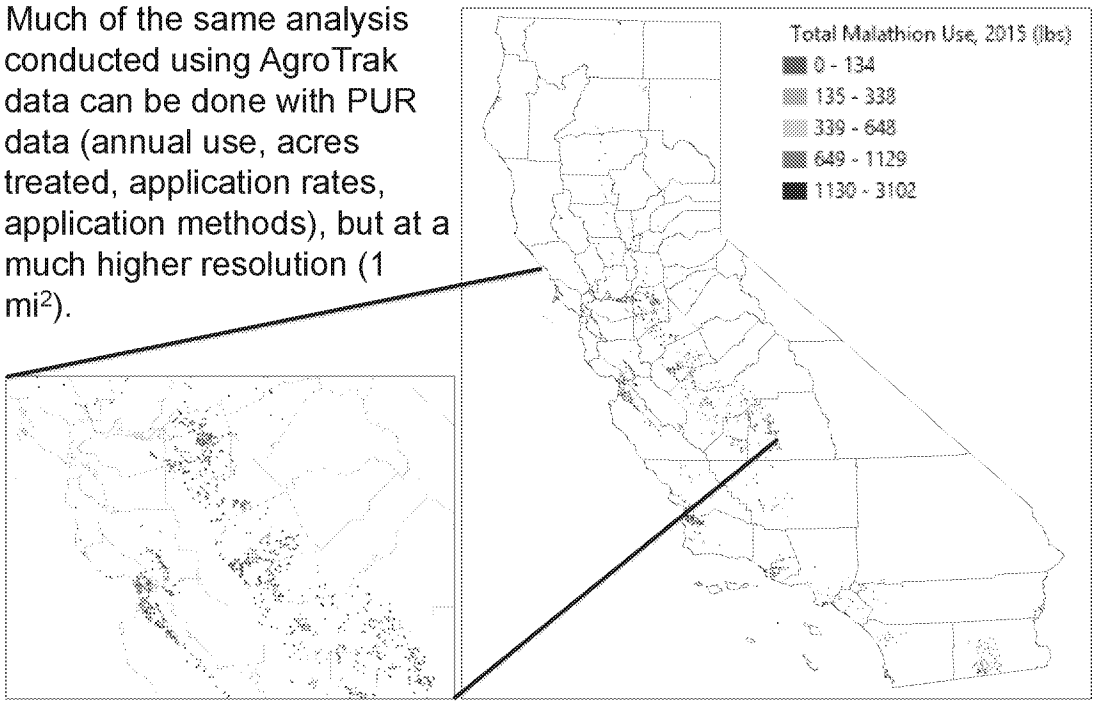
AgroTrak® Data for Malathion: Application Method by Crop

Understanding patterns for application method (aerial versus ground) is necessary to better estimate exposure due to potential spray drift. AgroTrak® data provides this information by crop and state.

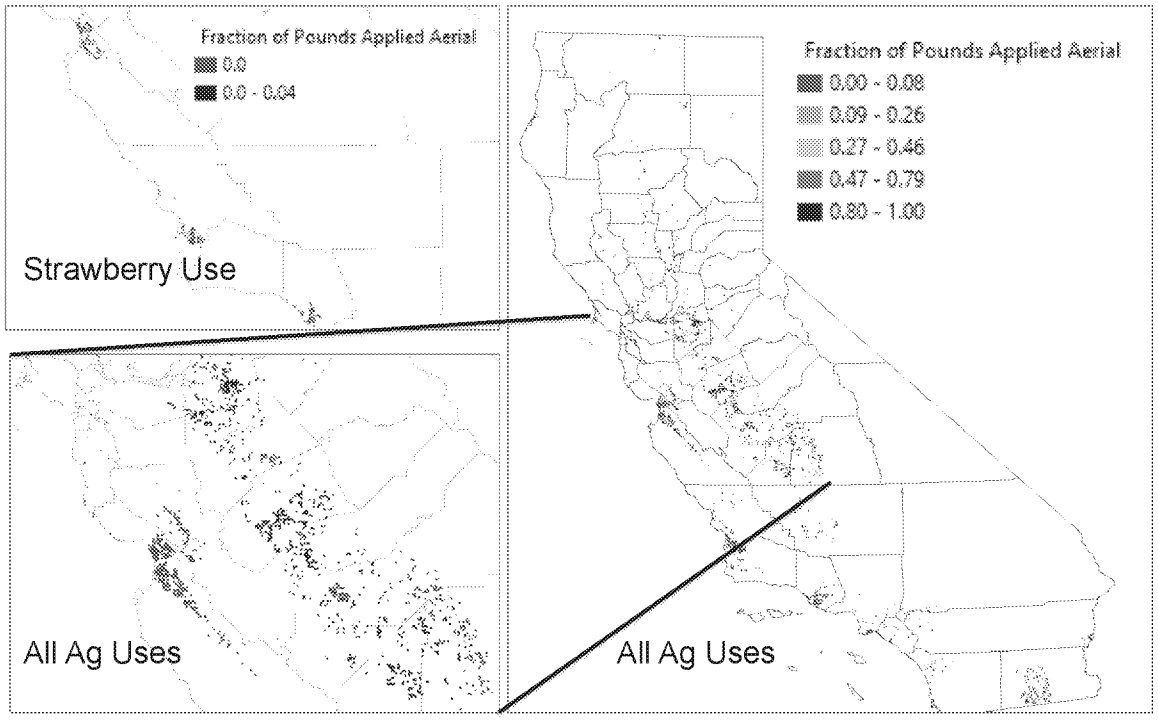


California PUR Data for Malathion: High Resolution Use

Much of the same analysis conducted using AgroTrak data can be done with PUR data (annual use, acres treated, application rates, application methods), but at a much higher resolution (1 mi^2).

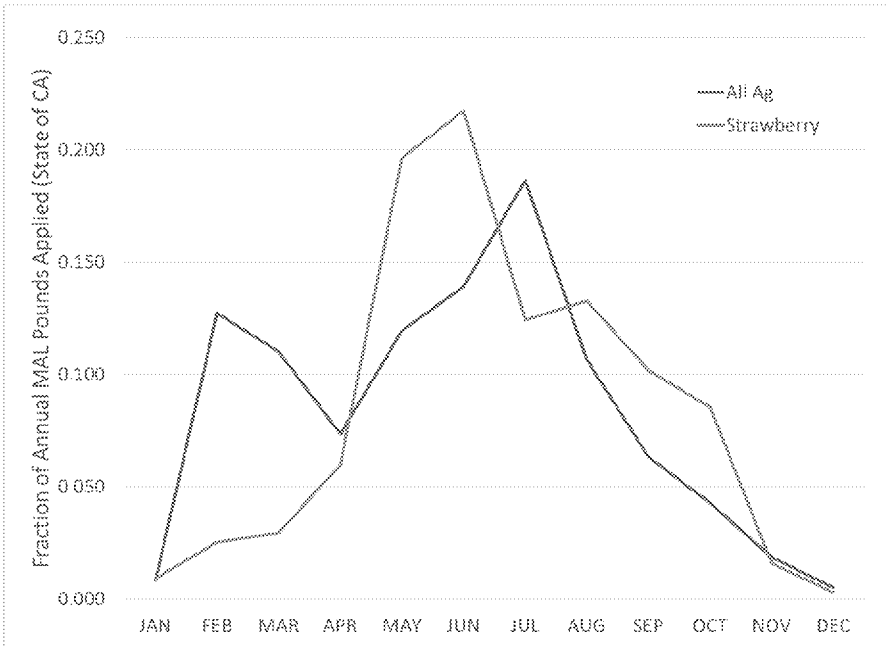


California PUR Data for Malathion: Fraction of Applications made by Aerial Spray



California PUR Data for Malathion: Temporal Distribution of Applications

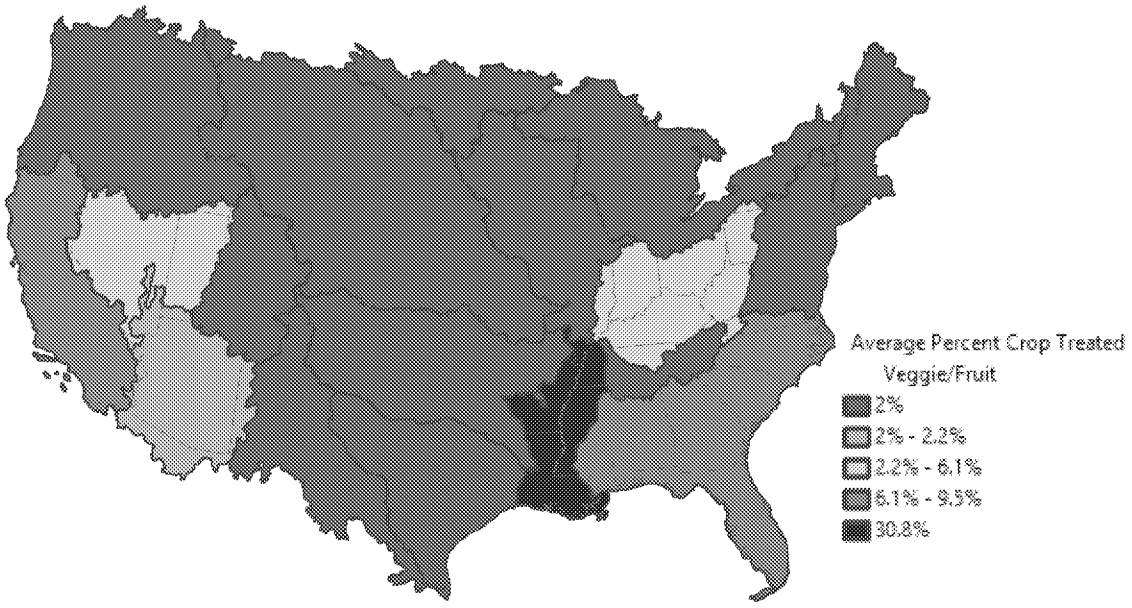
The temporal resolution of PUR data allows for refinement in application timing assumptions, which can refine exposure estimates.



Malathion Use Data in National ESA: Use Estimates

Goal: Exposure estimates to reflect likelihood of pesticide application.

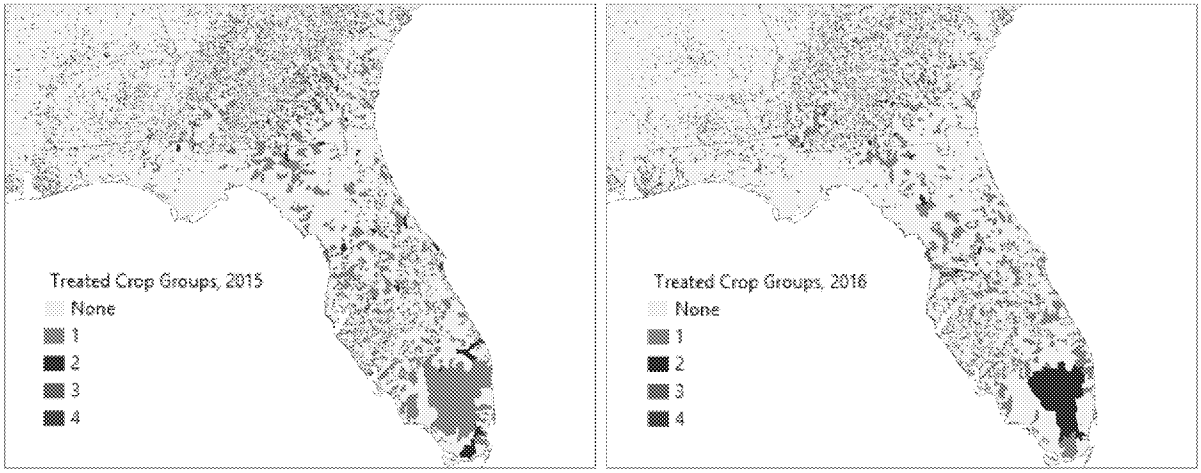
Start with Percent Crop Treated estimates made at the HUC2 watershed and Crop Group level based on AgroTrak® analysis.



Malathion Use Data in National ESA: Probabilistic Spatial Use Allocation

Exposure modeling at NHDPlus level (2.8 million catchments in US).

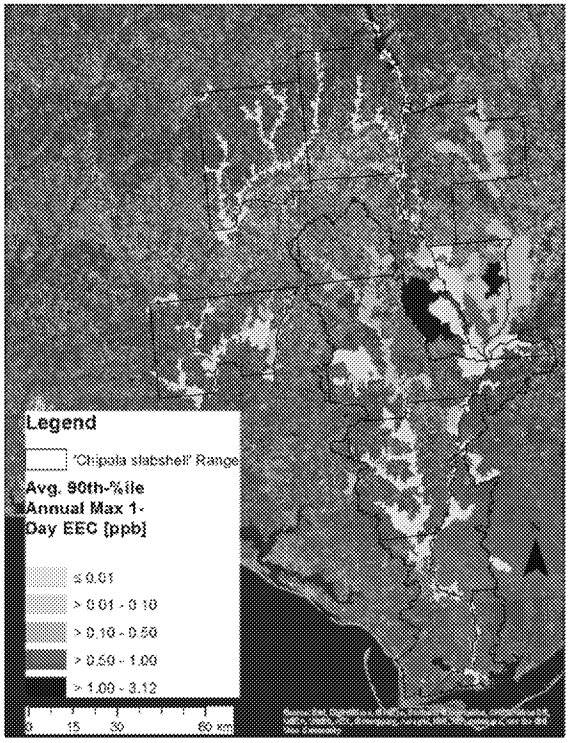
- Catchments selected randomly to achieve target PCT by crop group and HUC2
- applications can occur for a subset of crop groups in a catchment
- Random selection of crop groups treated in a catchment for multiple years results in different patterns of treated areas, generating ranges of exposure estimates.



Malathion Use Data in National ESA: Catchment Specific Probabilistic Exposure

Example: Chipola slabshell EECs (preliminary):

- Habitat consists of medium and high flow streams/rivers
  - Bin 3 (medium flow): 1 – 100 m^3/s
  - Bin 4 (high flow): > 100 m^3/s
- Exposure estimates are spatially explicit at the NHDPlus level
  - 1,079 catchments in and for
  - 5 years of CDL crop patterns
  - 5 independent samples of malathion use area based on Percent Crop Treated assumptions

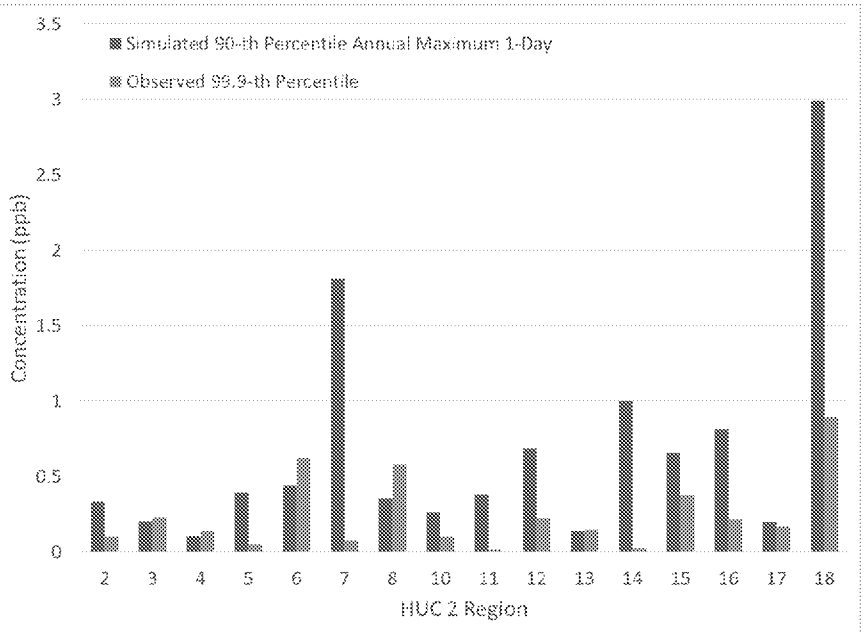


Malathion Use Data in National ESA: Comparison of EECs with Monitoring Data

Based on NAWQA data (32,782 samples), simulated 90th %-ile annual maximums are similar to 99.9th %-ile observed concentrations.

Flowing water EECs in EPA's final malathion BE were 124 ppb – 1,370 ppb

Simulated exposure much more realistic when actual use information is accounted for!!



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Comparison to national monitoring data described in EPA's Final Biological Evaluation for Malathion:
0.08% of the monitoring results are greater than 1 ppb (53 out of 70,000)
Maximum of observed: 22 ppb

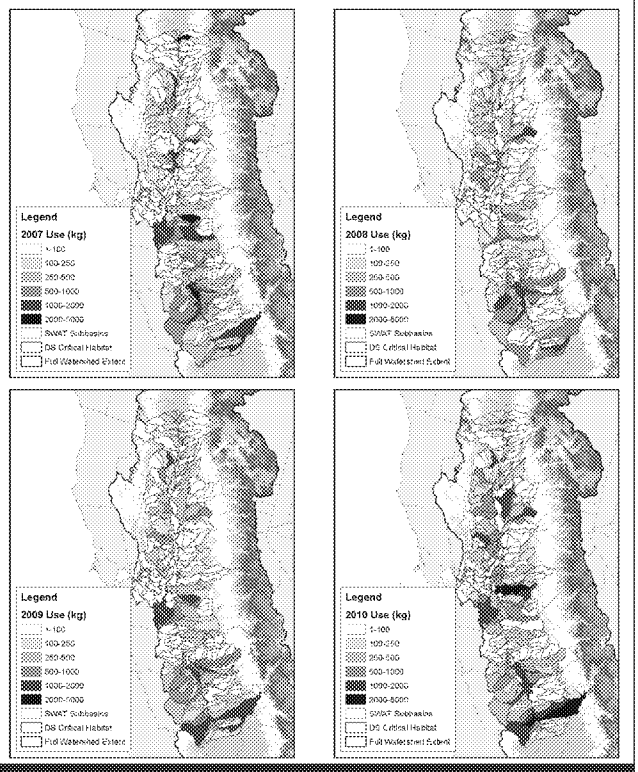
Malathion Use Data in California Delta Smelt ESA: Incorporate Actual Use Years

Use high spatial/temporal resolution PUR data

- Annual use aggregated for each subbasin
- Sample 5 years of PUR data

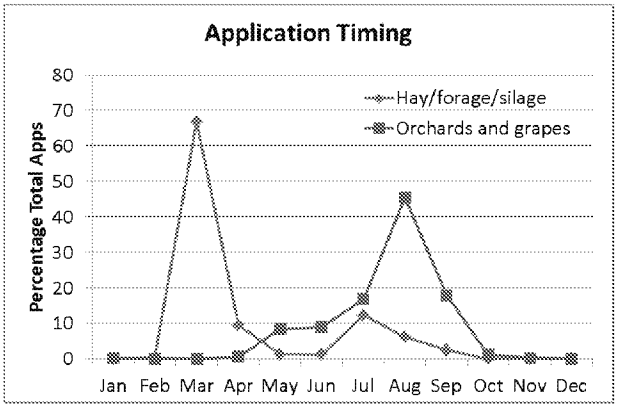
Malathion applications to crop locations within a subbasin are randomly selected to achieve subbasin target use

- Allows for practical level of model complexity
- Provides for more probabilistic exposure estimates

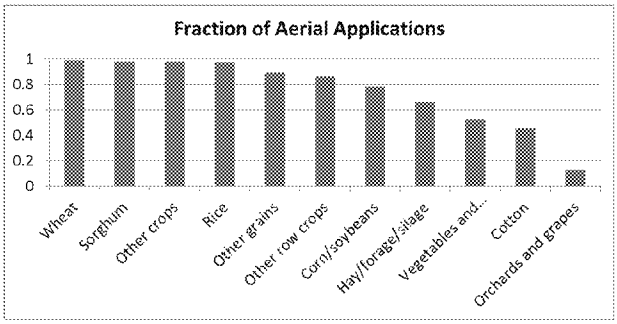


Malathion Use Data in California ESA: Application Timing and Method Variability

Probability distributions of application timing generated for each crop in each subbasin



Probability of ground and aerial application methods selected for each crop according to PUR

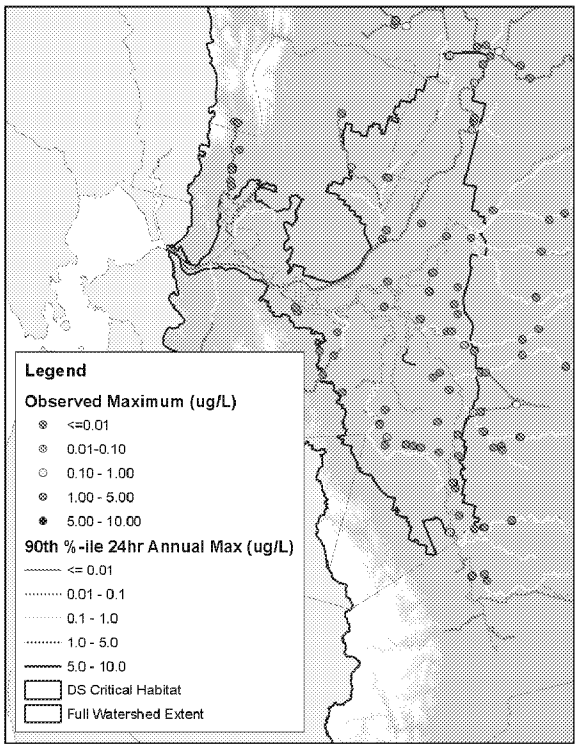


Malathion Use Data in California ESA: Resulting EECs

A Monte Carlo simulation approach was used to generate probability distributions of exposure accounting for uncertainty in:

- Percent Treated Area
- Spatial location of treated areas
- Timing of applications
- Method of application

Comparisons made with monitoring data showed predictions were close to observations and generally conservative.



Actual Pesticide Use Compared to Maximum Use: NMFS Biological Opinions

Actual use data from AgroTrak and PUR (California only) were used to estimate the median annual agricultural use for malathion, chlorpyrifos, and diazinon within Pacific Salmonid ESUs/DPSs.

Maximum agricultural use for each ESU/DPS was calculated based on the median crop group acreage reported in the NMFS Biological Opinions and the maximum annual use rates for the crop group modeled in EPA's Biological Evaluations.

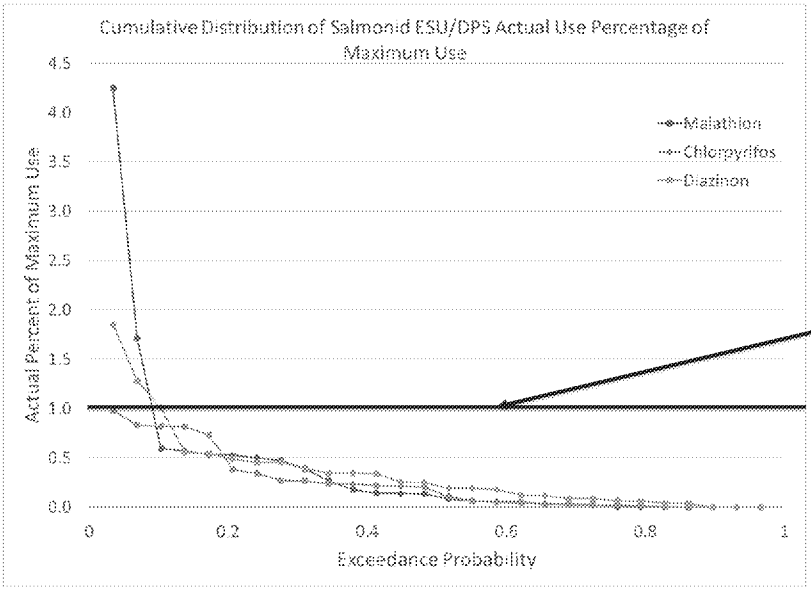
Differences in the use between maximum and actual are largely due to:

- Single applications at less than label maximum
- Fewer applications per year than label maximum
- Less than 100% of potential use sites treated
- Generalized crop groups in NMFS assessment over-representing crop group footprint

Actual Pesticide Use Compared to Maximum Use: Results for 3 OPs in Salmonid ESUs/DPSs

Actual use very rarely exceeded 1% of the assumed maximum use.

Assumed maximum use in 1 ESU (California Central Valley Steelhead) of 33.6 M lbs/yr is **5x higher than nationwide malathion annual use.**



Summary on Use Data in Exposure Assessments

Historical pesticide use data is available from multiple sources:

- Outside of California, the available pesticide use data will not tell exactly where and when a pesticide application occurred, but rather indicate the likelihood of application to a potential use site.
- Use data can be analyzed to estimate a range of use scenarios, including probability distributions of scenarios.
- Application method and rate information is also available.

Actual use data can be directly incorporated into probabilistic exposure modeling:

- Allows for estimates of exposure likelihood across a species range
- Exposure concentrations are consistent with monitoring data

Conservative assumptions of maximum potential use can be several orders of magnitude higher that actual use, leading to unrealistic exposure estimates used in endangered species risk assessments.

Thank you.

For more information / [redacted]